Twelfth Census of the United States.

CENSUS BULLETIN.

No. 164. WASHINGTON, D. C. April 29, 1902.

AGRICULTURE.

CALIFORNIA.

Hon. WILLIAM R. MERRIAM,
Director of the Census.

SIR: I have the honor to transmit herewith, for publication in bulletin form, the statistics of agriculture for the state of California, taken in accordance with the provisions of section 7 of the act of March 3, 1899. This section requires that—

> The schedules relating to agriculture shall comprehend the following topics: Name of occupant of each farm, color of occupant, tenure, acreage, value of farm and improvements, acreage of different products, quantity and value of products, and number and value of live stock. All questions as to quantity and value of crops shall relate to the year ending December thirty-first next preceding the enumeration.

A "farm," as defined by the Twelfth Census, includes all the land, under one management, used for raising crops and pasturing live stock, with the wood lots, swamps, meadows, etc., connected therewith. It includes also the house in which the farmer resides, and all other buildings used by him in connection with his farming operations.

The farms of California, June 1, 1900, numbered 72,542, and had a value of $707,912,960. Of this amount $77,468,000, or 10.9 per cent, represents the value of buildings, and $630,444,960, or 89.1 per cent, the value of land and improvements other than buildings. On the same date the value of farm implements and machinery was $21,311,670, and that of live stock, $67,303,325. These values, added to that of farms, give $796,527,955, the "total value of farm property."

The products derived from domestic animals, poultry, and bees, including animals sold and animals slaughtered on farms, are referred to in this bulletin as "animal products." The total value of all such products, together with the value of all crops, is termed "total value of farm products." This value for 1899 was $131,690,606, of which amount $36,324,894, or 27.6 per cent, represents the value of animal products, and $95,365,712, or 72.4 per cent, the value of crops, including forest products cut or produced on farms. The total value of farm products for 1899 exceeds that reported for 1889 by $44,057,316, or 51.3 per cent.

The value of "net farm products," or the "gross farm income," is obtained by deducting from the total value of farm products the value of the products fed to live stock on the farms of the producers. In 1899 the reported value of products fed was $13,488,570, leaving $118,202,036 as the gross farm income. The percentage which this latter amount is of the "total value of farm property" is referred to in the text as the "percentage of gross income upon investment." For California in 1899 it was 14.8 per cent.

As no reports of expenditures for taxes, interest, insurance, feed for stock, and similar items have been obtained by any census, no statement of net farm income can be given.

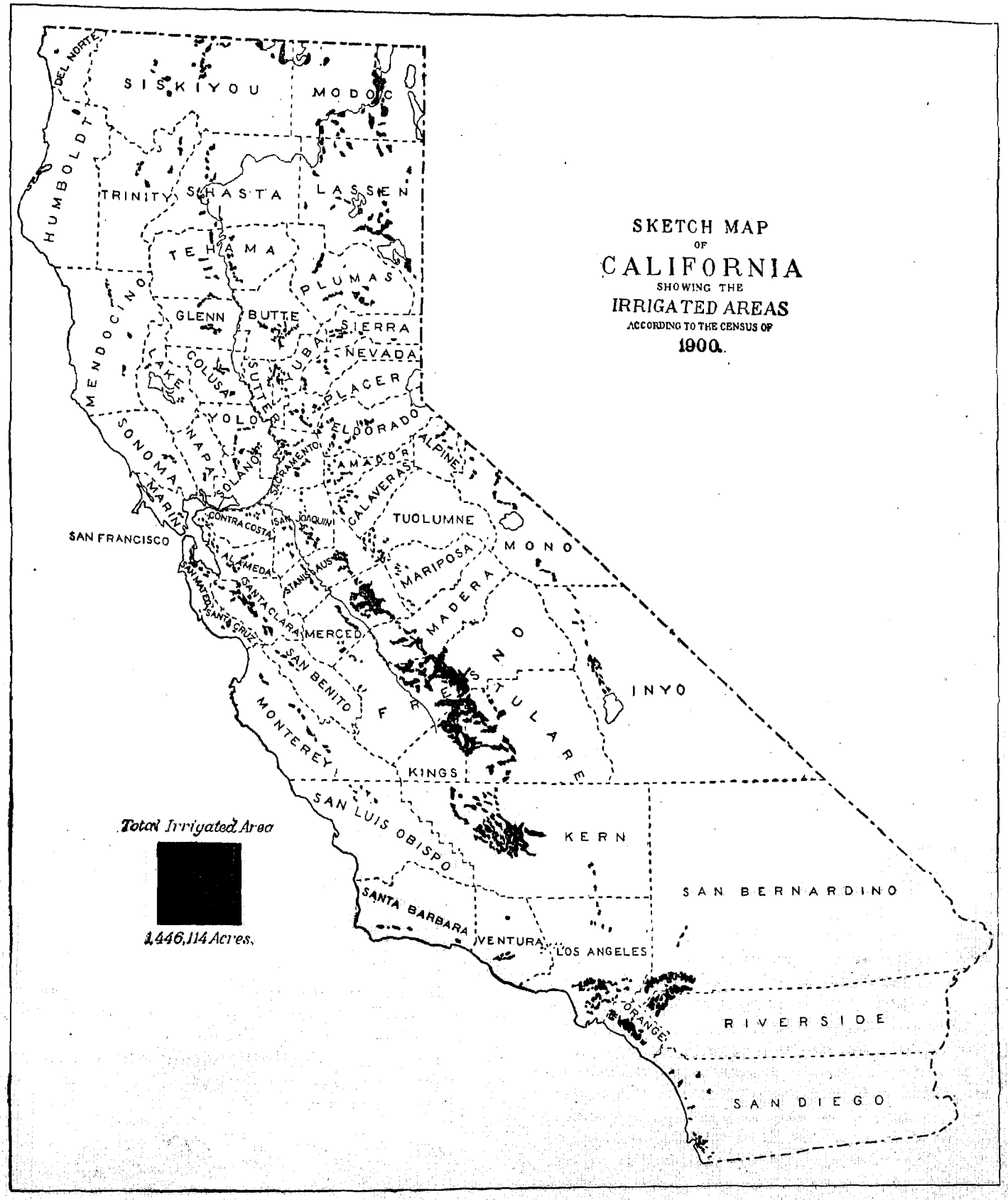
Special reports as to the dimensions and cost of the leading irrigation ditches and canals, the area of land under them, methods for the artificial application of water to the growing crops, and other facts relating to irrigation were obtained by correspondence with farmers, engineers, and others. This correspondence was under the joint direction of Mr. F. H. Newell, chief hydrographer of the Geological Survey, acting as expert special agent for the division of agriculture, and Mr. Clarence J. Blanchard.

The statistics presented in this bulletin will be treated in greater detail in the final report on agriculture in the United States, which will be published about June 1, 1902. The present publication is designed to present a summarized advance statement for California.

Very respectfully,

L. G. Powers.

Chief Statistician for Agriculture.


SKETCH MAP
OF
CALIFORNIA
SHOWING THE
IRRIGATED AREAS
ACCORDING TO THE CENSUS OF
1900.
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
NEVADA
LAKE
COLUSA
SUTTER
YUBA
PLACER
YOLO
EL DORADO
ALPINE
SONOMA
NAPA
SOLANO
SACRAMENTO
AMADOR
CALAVERAS
MARIN
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
MONO
SAN MATEO
SANTA CRUZ
SANTA CLARA
MERCED
MADERA
INYO
SAN BENITO
FRESNO
TULARE
MONTEREY
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
SAN DIEGO
Total Irrigated Area
1,446,114 Acres.

AGRICULTURE IN CALIFORNIA.

GENERAL STATISTICS.

California, the second largest state in the Union, has a total land area of 155,980 square miles, or 99,827,200 acres, of which 28,828,951 acres, or 28.9 per cent, are included in farms.

The northern part of the state is rugged and mountainous, but contains some fertile valleys of small size. From this region two mountain ranges extend southward, one along the coast and the other along the eastern boundary. Between these two ranges lie the Sacramento and San Joaquin valleys, comprising the largest body of farming land in the state. In the south the surface becomes more even, the coast mountains almost disappearing.

The soil of the northern valleys is very rich, but the mountains are generally wooded, and suitable only for grazing purposes. The soils of the Sacramento and San Joaquin valleys vary from a sandy loam to heavy clay, and are everywhere fertile. The southern part of the state is generally arid, but under an extensive system of irrigation the land has become exceedingly productive and valuable.

The diversity in the soil and in the climate of California renders possible a greater variety of agricultural products than is found in any other state of the Union.

NUMBER AND SIZE OF FARMS.

Table 1 gives, by decades since 1850, the number of farms, the total and average acreage, and the per cent of farm land improved.

TABLE 1.—FARMS AND FARM ACREAGE: 1850 TO 1900.

YEAR.	Number of farms.	NUMBER OF ACRES IN FARMS.				Per cent of farm land improved.
		Total.	Improved.	Unimproved.	Average.	
1900	72,542	28,828,951	11,958,837	16,870,114	397.4	41.5
1890	52,894	21,427,293	12,222,889	9,204,454	405.1	57.0
1880	35,924	16,523,742	10,669,698	5,924,044	461.8	64.3
1870	23,724	11,427,105	6,218,133	5,208,972	481.7	54.4
1860	18,716	8,730,084	2,468,084	6,262,000	466.4	28.3
1850	872	3,893,985	32,454	3,861,531	[1]4,465.0	0.8

Most of the farms reported in 1850 were cattle ranches operated by Mexicans under Spanish land grants. The discovery of gold in 1849, and the subsequent rapid immigration, resulted in abnormally high prices for farm produce and in a marked development of agriculture. The great increase in the area of improved farm land in the decade from 1850 to 1860 marks the real beginning of agriculture in California.

Since 1860 the number of farms has increased steadily, the rate of gain for the last decade being 37.1 per cent. The total area in farms, also, increased rapidly, from entry on the public domain and purchase or lease of railway subsidy lands. The increase in the area of improved farm land has kept pace with the general advancement, although, on account of the adoption by recent censuses of a stricter definition of the term "improved land," and the conversion of agricultural land into cattle ranches, a decrease is shown for the last decade. The average size of farms has decreased as intensive cultivation has become more general, and as special branches of agriculture have been developed.

FARM PROPERTY AND PRODUCTS.

Table 2 presents a summary of the principal statistics relating to farm property and products for each census year, beginning with 1850.

TABLE 2.—VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND OF FARM PRODUCTS: 1850 TO 1900.

YEAR.	Total value of farm property.	Land, improvements, and buildings.	Implements and machinery.	Live stock.	Farm products.[1]
1900	$796,527,955	$707,912,980	$21,811,670	$67,803,325	$181,690,606
1890	772,065,570	697,116,680	14,689,710	[2]60,259,230	87,033,290
1880	305,999,443	262,051,282	8,447,744	[2]35,500,417	59,721,425
1870[3]	184,521,470	141,240,028	5,816,490	37,964,752	[4]49,856,024
1860	86,870,327	48,726,804	2,558,606	35,585,017	----------
1850	7,328,582	3,874,041	108,488	3,351,058	----------

[1] For year preceding that designated.
[2] Exclusive of the value of animals on ranges.
[3] Values for 1870 were reported in depreciated currency. To reduce to specie basis of other figures, they must be diminished by one-fifth.
[4] Includes betterments and additions to live stock.

The total value of farm property increased very rapidly until 1890, but for the succeeding decade a gain of only 3.2 per cent is shown. This small increase is doubtless due in part to the financial disturbances in 1893, and the subsequent period of depression, as the very substantial gain made in the value of farm products furnishes conclusive evidence that the agricultural interests of the state are not declining. The value of land, improvements, and buildings increased 1.5 per cent from 1890 to 1900. The value of implements and machinery increased 45.1 per cent and that of farm products 51.3 per cent, a portion of each increase being, doubtless, the result of a more detailed enumeration in 1900 than heretofore. In the same period the value of live stock increased 11.7 per cent.

The low value of land, improvements, and buildings in 1850 and the high value of live stock, which nearly equalled that of all other forms of farm property, were due to the conditions explained above. The decreasing percentage of the total value of farm property represented by the value of live stock, and the rapidly increasing relative value of implements and machinery, reflect the gradual transition from grazing and stock raising in general to intensive cultivation of the soil.

COUNTY STATISTICS.

Table 3 gives an exhibit of general agricultural statistics by counties.

TABLE 3.—NUMBER AND ACREAGE OF FARMS, AND VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, JUNE 1, 1900, WITH VALUE OF PRODUCTS OF 1899 NOT FED TO LIVE STOCK, AND EXPENDITURES IN 1899 FOR LABOR AND FERTILIZERS, BY COUNTIES.

COUNTIES.	NUMBER OF FARMS.		ACRES IN FARMS.		VALUES OF FARM PROPERTY.				Value of products not fed to live stock.	EXPENDITURES.	
	Total.	With buildings.	Total.	Improved.	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		Labor.	Fertilizers.
The State	72,542	69,267	28,828,951	11,958,837	$630,444,960	$77,468,000	$21,311,670	$67,303,325	$118,202,036	$26,845,120	$937,050
Alameda	2,787	2,713	338,289	226,118	28,751,590	3,485,310	780,040	1,602,596	4,190,601	989,680	15,180
Alpine	37	37	15,681	4,391	198,100	45,400	10,810	70,131	61,911	6,970	
Amador	560	554	214,024	48,936	2,185,150	495,630	127,130	510,890	479,830	84,870	2,140
Butte	1,179	1,150	677,080	302,029	12,460,530	1,434,870	439,390	1,200,614	2,910,288	617,900	21,150
Calaveras	575	572	212,820	41,402	1,893,510	427,130	89,030	425,929	385,182	78,350	840
Colusa	582	569	550,002	358,227	10,885,350	838,420	417,690	913,023	3,023,958	611,760	8,640
Contra Costa	1,511	1,483	406,563	262,617	15,568,110	1,675,790	404,590	1,240,897	2,656,274	690,010	10,990
Del Norte	131	129	33,115	9,757	687,830	121,840	35,180	176,240	184,553	38,440	
Eldorado	759	757	209,320	45,481	1,546,240	666,120	116,320	361,891	543,446	71,600	2,010
Fresno	3,290	3,171	1,284,736	786,387	34,201,630	3,092,140	1,593,890	3,941,919	6,671,875	1,571,010	39,870
Glenn	529	518	577,363	355,781	8,473,830	719,510	299,620	806,340	1,934,303	403,170	60
Humboldt	1,500	1,484	648,511	77,238	9,524,850	1,252,880	311,020	2,123,049	1,916,256	363,880	8,760
Inyo	424	392	141,059	43,740	1,584,750	317,060	95,590	574,229	394,846	59,750	90
Kern	1,098	1,021	1,571,106	324,031	10,404,540	664,120	347,040	2,829,825	1,910,723	814,020	4,420
Kings	932	855	387,505	262,148	3,420,410	811,920	348,330	1,341,247	1,974,900	486,780	920
Lake	723	706	212,176	41,414	2,419,280	524,180	111,420	440,210	582,491	75,970	170
Lassen	555	550	381,109	183,266	2,949,510	708,010	255,220	1,452,875	652,646	814,790	8,700
Los Angeles	6,577	6,062	895,663	518,744	64,189,220	6,702,710	1,433,050	2,492,666	7,527,630	1,430,310	200,310
Madera	523	517	484,659	277,721	4,568,770	433,050	214,100	683,974	1,301,834	283,990	800
Marin	462	461	322,374	47,583	8,330,450	914,020	207,110	1,414,931	1,518,299	330,900	4,000
Mariposa	387	370	160,156	14,008	752,090	207,040	59,960	308,461	211,222	25,450	420
Mendocino	1,452	1,420	742,924	78,907	5,840,250	1,081,090	219,630	1,446,546	1,570,504	255,450	5,330
Merced	999	974	1,702,967	618,376	18,449,650	984,040	501,480	2,701,639	2,680,958	847,190	4,730
Modoc	688	623	298,755	122,947	2,825,360	521,900	174,200	1,842,367	1,097,713	143,320	4,280
Mono	112	104	183,068	65,298	519,040	87,380	26,340	542,988	332,952	28,560	500
Monterey	1,850	1,785	1,087,082	378,605	15,632,700	1,353,700	502,400	1,920,942	2,852,901	572,080	2,920
Napa	1,836	1,819	319,327	111,966	8,925,780	2,181,590	357,980	871,696	1,345,705	329,890	12,690
Nevada	522	518	120,748	24,898	1,116,960	447,640	102,910	280,030	421,769	51,600	5,430
Orange	2,388	2,310	599,486	236,847	18,583,640	2,177,040	456,500	1,179,415	2,549,777	447,010	16,520
Placer	1,076	1,028	440,371	121,063	4,839,780	998,620	222,060	487,351	1,407,787	259,560	13,680
Plumas	267	259	184,449	57,351	1,211,530	387,010	97,240	544,036	420,959	118,070	70
Riverside	2,340	1,949	427,097	216,033	18,488,110	1,999,850	399,280	756,791	3,029,158	580,670	203,010
Sacramento	1,392	1,303	608,426	327,159	15,189,870	2,159,630	528,780	1,448,346	4,608,388	976,560	2,190
San Benito	907	885	512,719	168,698	7,057,190	852,340	272,030	935,498	1,034,360	168,320	3,620
San Bernardino	2,350	1,978	219,132	96,920	21,000,370	2,578,120	395,860	687,052	2,364,492	599,700	151,320
San Diego	2,698	2,566	809,419	229,791	14,133,990	2,170,190	533,980	1,508,517	1,824,665	416,010	22,980
San Francisco	304	298	8,219	3,829	1,855,030	228,100	71,200	253,563	1,025,600	249,070	5,600
San Joaquin	1,966	1,920	751,065	652,923	25,769,590	2,297,180	907,410	2,244,294	6,134,421	1,214,290	20,760
San Luis Obispo	1,813	1,774	1,084,480	412,356	11,138,180	1,272,820	479,840	1,749,917	2,211,273	688,640	2,200
San Mateo	551	544	149,944	72,429	8,201,140	1,333,390	173,600	646,726	1,124,795	199,190	2,070
Santa Barbara	1,149	1,116	922,611	202,982	14,849,440	1,375,290	365,770	1,681,363	2,095,342	437,370	8,870
Santa Clara	3,995	3,748	710,686	290,235	42,270,340	5,382,710	1,287,560	1,834,093	6,195,605	1,366,480	25,490
Santa Cruz	1,274	1,244	160,438	62,849	9,094,410	1,452,020	246,930	649,799	2,008,218	419,280	1,450
Shasta	1,221	1,191	847,120	86,540	2,980,620	588,500	163,450	787,853	837,270	100,970	990
Sierra	141	131	74,609	26,687	564,990	179,770	37,480	213,155	208,428	32,680	1,310
Siskiyou	931	922	452,859	181,029	5,084,110	1,056,390	284,520	1,279,749	1,391,881	255,480	3,890
Solano	1,151	1,115	480,561	344,058	16,903,310	1,935,970	649,320	1,821,884	4,014,705	845,660	17,700
Sonoma	3,676	3,591	785,064	221,874	25,286,750	4,646,580	847,240	2,291,137	5,045,289	1,015,320	12,080
Stanislaus	951	911	830,692	622,700	13,674,850	1,287,900	537,280	1,581,920	2,852,875	621,760	1,570
Sutter	728	694	293,287	206,877	6,976,320	987,700	313,780	904,931	1,857,801	298,760	1,000
Tehama	1,355	1,080	950,753	269,693	11,720,120	2,091,860	440,020	1,778,104	1,971,266	514,330	15,720
Trinity	272	258	76,088	14,144	583,450	171,550	31,180	254,689	157,720	83,560	170
Tulare	2,212	2,105	1,059,727	546,289	15,898,600	1,376,960	715,460	2,296,791	3,150,508	777,240	8,900
Tuolumne	457	457	204,758	36,461	1,284,260	397,850	102,070	346,965	423,742	51,110	2,220
Ventura	1,260	1,236	552,859	174,419	18,549,290	1,491,260	482,270	910,677	2,612,110	658,070	8,780
Yolo	1,214	1,174	552,065	351,213	15,906,280	1,985,590	510,430	1,637,451	3,427,923	681,580	16,110
Yuba	488	480	312,321	154,013	3,875,150	637,130	151,650	589,638	879,308	242,950	1,700
Hupa Valley[1]	88	87	5,784	1,055	66,150	15,880	9,430	24,325	24,136	1,600	
Mission[1]	58	50	1,523	1,048	32,400	6,470	3,110	7,825	2,975	730	
Round Valley[1]	118	113	4,767	2,778	107,180	54,180	11,210	41,490	19,897	290	300
Tule River[1]	28	26	5,045	363	13,190	2,110	1,670	13,291	5,507	190	

[1] Indian reservation.

During the past decade the number of farms increased rapidly in nearly all counties. In San Francisco and Tuolumne counties the number of farms reported in 1900 was more than double that of ten years before, and in Inyo, Siskiyou, and Los Angeles counties the gains were nearly as great. Seven counties show decreases, but, with the exception of Colusa and Amador, whose losses are 48.4 and 20.0 per cent, respectively, they were all comparatively slight. The decrease in Colusa county was doubtless due to a change in boundary since 1890.

The total area of farm land in the state is 34.5 per cent greater than in 1890. In Tuolumne, San Francisco, Mono, Orange, Kern, and Inyo counties the farm area more than doubled. Of the decreases shown, the largest were for Colusa and San Bernardino counties.

The percentage of farm land improved was less than it was in 1890 in all counties except in those showing marked increases in total farm acreage, and in a few counties around the cities of San Francisco and Los Angeles. A comparison with the figures for 1890 shows a gain in the

total acreage devoted to crops in nearly all counties, even in those showing the greatest decreases in improved land.

A lower value of land and buildings than in 1890 is reported for all counties except Los Angeles, Ventura, and Santa Barbara in the southwest; San Joaquin, Calaveras, and most of the counties bordering upon San Francisco Bay, in the central part; and Sierra, Plumas, Lassen, Modoc, and Siskiyou counties in the northeast. These counties are, as a rule, adapted to the growing of fruits and vegetables, while the other parts of the state are devoted, in general, to hay and forage and to live-stock raising.

The value of implements and machinery has increased since 1890 in every county except Colusa, Butte, Amador, and Yuba, which show decreases of 43.7, 18.5, 14.8, and 10.7 per cent, respectively. The largest relative gains are in those counties where fruit raising and dairying are the leading branches of agriculture.

The total value of live stock has increased 11.7 per cent, the largest relative increase being in Tuolumne county. The general agricultural progress of this county in the past ten years, which has been very marked, is probably due to its large relative increase in population.

The average expenditure per farm for labor was $356 for the state, and ranged from $67 in Mariposa county to $1,051 in Colusa county. In the latter county $1.11 was expended for every acre of farm land. The average was highest in San Francisco county, where it amounted to $30.30 per acre.

The amount expended for fertilizers in 1900 was more than six times as great as it was ten years before. Large increases were shown for all counties except San Francisco and Shasta. As a rule, the counties reporting the largest acreages in fruits reported also the highest average expenditures for both labor and fertilizers.

INCREASE IN THE NUMBER OF FARMERS IN CALIFORNIA.

From 1850 to 1900 the population of California increased from 92,597 to 1,485,053, or sixteenfold, while the number of farms increased from 872 to 72,542, or over eightyfold. In other words, from 1850 to 1900 the number of farms, and hence the number of persons operating them as owners or tenants, increased faster than the population. This statement applies also to the decades, 1850 to 1860, 1870 to 1880, and 1890 to 1900.

Data showing, with any exactness, the relative increases in the various classes of the farm population are available for only a portion of the fifty years covered by the foregoing comparisons. That portion is the period from 1870 to 1890, during which time the number of farms, and hence of farm owners and tenants, increased approximately 123.0 per cent, while the total state population increased but 115.6 per cent. During the same period the number of males engaged in agriculture increased from 47,580 to 126,711, a gain of 166.3 per cent, which represents approximately the rate of increase in the total number of persons living on farms; and the number of males working for wages on farms increased from 16,156 to 51,532, or 219.0 per cent. These figures show that, in the period mentioned, California was one of the few states that added more to its agricultural than to its other population. Of the different classes of farming population the gain was largest among those working for wages, although the numbers of farm owners and tenants increased faster than the total population. This increase in the number of those working for wages in California was incidental to the introduction of more intensive methods of cultivation, and to the development of such special branches of agriculture as fruit growing, in which California now leads. The beginnings of these changes were made by the owners of the large ranches into which the entire farming area of California was originally divided.

In the last decade the number of farms, and hence, of owners and tenants, increased 37.1 per cent, while the total rural population increased but 12.7 per cent. This indicates that in the last ten years, unlike the two decades preceding, the number of persons operating farms as owners or tenants increased faster than the number of those who worked for wages. The more intensive cultivation of the soil and the growing of fruit, which were introduced between 1870 and 1890 by large capitalists who employed many hired laborers, seem now to be passing to a considerable extent into the hands of smaller farmers, who, as owners or tenants, manage and cultivate their lands in person. The following statistics of farm tenure, if studied in connection with the statistics of population for 1900, already published, and those of occupations, now being tabulated by the division of population, will throw much light upon the changes which have taken place in the social and economic condition of the agriculturists of this state.

FARM TENURE.

Table 4 gives a comparative exhibit for 1880, 1890, and 1900, of the number of farms operated by owners, cash tenants, and share tenants. Table 4*a* presents, for the two decades covered by Table 4, the per cent of increase in rural population, in the total number of farms, and in the number of farms of specified tenures. In Table 5 the tenure of farms for 1900 is given by race of farmer, and the farms operated by owners are subdivided into groups designated as farms operated by "owners," "part owners," "owners and tenants," and "managers." These groups comprise, respectively: (1) Farms operated by individuals who own all the land they cultivate; (2) farms operated by individuals who own a part of the land and rent the remainder from others; (3) farms operated under the joint direction and by the united labor of two or more individuals, one owning the farm or a part of it, and the other, or others, owning no part, but receiving for supervision or labor a share of the products; and (4) farms operated by individuals who receive for their supervision and other services a fixed salary from the owners.

The farms operated by tenants are divided into groups designated as farms operated by "cash tenants" and farms operated by "share tenants." These groups comprise,

respectively: (1) Farms operated by individuals who pay a cash rental, or a stated amount of labor or farm produce; and (2) farms operated by individuals who pay as rental a stated share of the products.

TABLE 4.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES: 1880 TO 1900.

YEAR.	Total number of farms.	NUMBER OF FARMS OPERATED BY—			PER CENT OF FARMS OPERATED BY—		
		Owners.[1]	Cash tenants.	Share tenants.	Owners.[1]	Cash tenants.	Share tenants.
1900	72,542	55,782	9,074	7,686	76.9	12.5	10.6
1890	52,894	43,489	4,574	4,831	82.2	8.7	9.1
1880	35,934	28,810	3,209	3,915	80.2	8.9	10.9

[1] Including "part owners," "owners and tenants," and "managers."

TABLE 4a.—PER CENT OF INCREASE IN RURAL POPULATION, IN THE TOTAL NUMBER OF FARMS, AND IN THE NUMBER OF FARMS OF SPECIFIED TENURES, FOR THE DECADES, 1880 TO 1890 AND 1890 TO 1900, AND FOR THE TWENTY-YEAR PERIOD, 1880 TO 1900.

PERIOD.	PER CENT OF INCREASE IN—					
	Rural population.	Total number of farms.	Number of farms operated by—			
			All owners.	All tenants.	Cash tenants.	Share tenants.
1890-1900	12.7	37.1	28.3	78.2	98.4	59.1
1880-1890	26.6	47.2	51.0	32.0	42.5	23.4
1880-1900	42.7	101.9	93.6	185.3	182.8	96.3

TABLE 5.—NUMBER AND PER CENT OF FARMS OF SPECIFIED TENURES, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER.

PART 1.—NUMBER OF FARMS OF SPECIFIED TENURES.

RACE.	Total number of farms.	Owners.	Part owners.	Owners and tenants.	Managers.	Cash tenants.	Share tenants.
The State	72,542	44,009	8,211	309	3,253	9,074	7,686
White	70,935	43,298	8,165	306	3,224	8,407	7,535
Colored	1,607	711	46	3	29	667	151
Chinese	777	29	7	----	16	620	105
Indian	658	595	30	3	8	10	12
Japanese	87	4	----	----	1	22	10
Negro	135	83	9	----	4	15	24

PART 2.—PER CENT OF FARMS OF SPECIFIED TENURES.

The State	100.0	60.7	11.3	0.4	4.5	12.5	10.6
White	100.0	61.0	11.5	0.4	4.6	11.9	10.6
Colored	100.0	44.2	2.9	0.2	1.8	41.5	9.4

The percentages shown in Table 4*a* indicate a marked improvement, in the last two decades, in the social and economic condition of the California farmer. During this period great additions were made to the rural population, partly by immigration from other states and from foreign countries. The number of farms operated by owners increased 93.6 per cent, and the number operated by tenants 135.3 per cent, the former showing the greater increase from 1880 to 1890 and the latter from 1890 to 1900. Had the number of farms operated by owners increased only as fast as the rural population, the number of such farms in 1900 would have been less than it was by 14,670. The gain in the number of tenants, above the gain that would have been made had the rate of increase been the same as that for rural population, was 6,596. A part of this increase, relatively large, in the number of farm owners and tenants since 1880 is doubtless due to the fact that the increase in the number of persons engaged in agriculture was greater than in the number of those employed in lumbering, mining, and kindred occupations. The change shown by these figures, in the average condition of persons working on farms, is the opposite of that reflected in the occupation tables of 1870 to 1890, which showed a greater increase in the number of farm laborers than in the number of owners and tenants.

Table 5 shows that 1,607, or but 2.2 per cent, of the farms of the state are operated by colored farmers. Of the white farmers 72.9 per cent own all or a part of the farms they operate, and 27.1 per cent operate farms owned by others. For colored farmers the corresponding percentages are 47.3 and 52.7.

Chinese farmers are nearly all tenants, and as a rule pay a cash rental. The Indians generally own the farms they operate.

No previous census has reported the number of farms operated by "part owners," "owners and tenants," or "managers," but it is believed that the number conducted by the last-named class is constantly increasing.

FARMS CLASSIFIED BY RACE OF FARMER AND BY TENURE.

Tables 6 and 7 present the principal statistics for farms classified by race of farmer and by tenure.

TABLE 6.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY RACE OF FARMER AND BY TENURE, WITH PERCENTAGES.

RACE OF FARMER, AND TENURE.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State	72,542	397.4	28,828,951	100.0	$796,527,955	100.0
White farmers	70,935	404.0	28,658,311	99.4	787,610,449	98.9
Colored farmers	1,607	106.2	170,640	0.6	8,917,506	1.1
Chinese	777	101.2	78,609	0.3	7,164,287	0.9
Indian	658	95.1	62,606	0.2	713,262	0.1
Japanese	87	124.1	4,503	(1)	545,661	0.1
Negro	135	183.9	24,852	0.1	494,296	(1)
Owners	44,009	229.8	10,114,649	35.1	337,425,462	42.4
Part owners	8,211	600.8	4,933,421	17.1	124,467,844	15.6
Owners and tenants	309	459.1	141,875	0.5	3,823,782	0.5
Managers	3,253	2,152.5	7,002,038	24.3	141,116,829	17.7
Cash tenants	9,074	329.9	2,993,879	10.4	89,247,117	11.2
Share tenants	7,686	474.0	3,643,089	12.6	100,447,471	12.6

[1] Less than one-tenth of 1 per cent.

TABLE 7.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY RACE OF FARMER AND BY TENURE.

RACE OF FARMER, AND TENURE.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State	$8,690	$1,068	$294	$928	$1,629	14.8
White farmers	8,779	1,084	297	943	1,682	14.7
Colored farmers	4,777	354	160	258	1,530	27.6
Chinese	8,300	467	226	227	2,807	30.4
Indian	628	146	58	257	173	16.0
Japanese	11,804	1,782	899	262	2,181	14.8
Negro	2,790	326	102	443	622	17.0
Owners	5,810	1,000	221	635	1,119	14.6
Part owners	12,251	1,215	462	1,231	2,391	15.8
Owners and tenants	9,546	1,285	472	1,135	2,050	16.6
Managers	35,185	3,157	816	4,273	5,411	12.5
Cash tenants	7,951	723	219	942	1,649	16.8
Share tenants	11,082	812	395	830	2,101	16.1

Of the farms of the state 97.8 per cent are operated by white farmers and 2.2 per cent by colored farmers. The average values of the various forms of farm property and the average value of products are much lower for farms operated by colored farmers than for those operated by white farmers. The higher percentage of gross income for colored farmers is largely due to the fact that the farms operated by Chinese and Japanese are nearly all intensively cultivated vegetable farms, vineyards, orchards, etc. The percentages for farms of negroes and Indians do not differ widely from those shown for white farmers.

The average values shown for farms operated by Chinese and Japanese are very high, but it should be borne in mind that very few of the Chinese and Japanese own the farms they operate, and that the farms which they do own have very much lower average values than the farms which they rent.

The farms conducted by managers have larger average areas and higher average values of property and products than the farms of any other group by tenure. The large ranches, vineyards, and orchards of which this group is chiefly composed represent greater investments, and their operation generally requires more capital, than the average farmer can command. Men wealthy enough to own such farms rarely operate them in person.

FARMS CLASSIFIED BY AREA.

Tables 8 and 9 present the principal statistics for farms classified by area.

TABLE 8.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY AREA, WITH PERCENTAGES.

AREA.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State	72,542	397.4	28,828,951	100.0	$796,527,955	100.0
Under 3 acres	1,492	2.3	3,481	(1)	3,189,393	0.4
3 to 9 acres	5,354	6.4	34,075	0.1	16,451,400	2.1
10 to 19 acres	8,236	13.0	106,883	0.4	37,981,195	4.8
20 to 49 acres	18,110	29.4	385,844	1.3	76,286,267	9.6
50 to 99 acres	8,067	71.7	578,102	2.0	64,160,713	8.0
100 to 174 acres	13,196	147.4	1,945,423	6.7	83,154,197	10.4
175 to 259 acres	4,635	212.6	985,507	3.4	45,909,915	5.8
260 to 499 acres	8,370	360.0	3,012,949	10.5	98,297,282	12.3
500 to 999 acres	5,329	691.5	3,685,027	12.8	99,489,775	12.5
1,000 acres and over	4,753	3,806.4	18,091,660	62.8	271,661,888	34.1

(1) Less than one-tenth of 1 per cent.

TABLE 9.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY AREA.

AREA.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State	$8,690	$1,068	$294	$928	$1,629	14.8
Under 3 acres	1,023	630	53	432	592	27.7
3 to 9 acres	2,091	765	82	135	432	14.1
10 to 19 acres	3,508	819	120	165	627	13.6
20 to 49 acres	4,594	819	164	242	865	14.9
50 to 99 acres	6,407	987	235	374	1,244	15.6
100 to 174 acres	4,890	729	200	482	1,026	16.3
175 to 259 acres	7,846	1,023	310	726	1,640	16.6
260 to 499 acres	9,185	1,166	370	1,023	1,852	15.8
500 to 999 acres	14,910	1,518	536	1,696	2,881	15.4
1,000 acres and over	46,219	3,195	1,205	6,587	7,678	18.4

The group of farms each containing 1,000 acres or over comprises more than one-third of the total value of farm property and nearly two-thirds of the total farm acreage.

With a few exceptions the average values of the several forms of farm property and products increase with the size of the farm. The high average value of live stock for farms under 3 acres is due to the fact that some of them are stock farms using ranges and a large number are city dairies. The high average and percentage of gross income shown for this group are due to the fact that, in addition to these stock farms and dairies, it includes 125 florists' establishments. It should be borne in mind that the incomes from dairies and florists' establishments are determined not so much by the acreage of land used as by the amount of capital invested in buildings, implements, and

live stock, and the amounts expended for labor and fertilizers.

The average gross incomes per acre for the various groups classified by area are as follows: Farms under 3 acres, $253.89; 3 to 9 acres, $67.86; 10 to 19 acres, $48.39; 20 to 49 acres, $29.40; 50 to 99 acres, $17.35; 100 to 174 acres, $6.96; 175 to 259 acres, $7.71; 260 to 499 acres, $5.14; 500 to 999 acres, $4.17; 1,000 acres and over, $2.02.

FARMS CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

In Tables 10 and 11 the farms are classified by principal source of income. If the value of the hay and grain raised on any farm exceeds that of any other crop and constitutes at least 40 per cent of the total value of products not fed to live stock, the farm is classified as a "hay and grain" farm. If vegetables are the leading crop, constituting 40 per cent of the value of the products, it is a "vegetable" farm. The farms of the other groups are classified in accordance with the same general principle. "Miscellaneous" farms are those whose operators do not derive 40 per cent of their income from any one class of farm products. Farms which yielded no income in 1899 are classified according to the agricultural operations upon other farms in the same locality.

TABLE 10.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME, WITH PERCENTAGES.

PRINCIPAL SOURCE OF INCOME.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State	72,542	397.4	28,828,951	100.0	$796,527,955	100.0
Hay and grain	19,048	533.0	10,151,913	35.2	271,527,804	34.1
Vegetables	3,045	89.0	270,936	0.9	18,596,019	2.3
Fruits	18,537	96.0	1,780,122	6.2	214,856,477	27.0
Live stock	15,418	812.3	12,523,729	43.5	157,285,289	19.7
Dairy produce	8,686	274.8	2,387,154	8.3	76,204,051	9.6
Sugar	886	179.0	69,098	0.2	6,542,653	0.8
Flowers and plants	208	8.3	1,726	(1)	1,280,281	0.2
Nursery products	141	47.4	6,689	(1)	1,781,188	0.2
Miscellaneous[2]	7,073	231.5	1,687,584	5.7	48,455,193	6.1

[1] Less than one-tenth of 1 per cent.
[2] Including 1 tobacco farm.

TABLE 11.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY PRINCIPAL SOURCE OF INCOME.

PRINCIPAL SOURCE OF INCOME.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State	$8,690	$1,068	$294	$928	$1,629	14.8
Hay and grain	11,747	1,119	425	962	2,109	14.8
Vegetables	5,088	578	172	278	1,559	25.5
Fruits	9,609	1,386	325	272	1,670	14.4
Live stock	7,208	863	207	1,928	1,453	14.2
Dairy produce	6,445	979	218	1,130	1,226	14.0
Sugar	15,371	684	859	535	3,575	21.1
Flowers and plants	3,684	2,248	177	46	2,856	46.4
Nursery products	10,749	1,492	257	134	3,749	29.7
Miscellaneous[1]	5,351	899	193	468	966	14.1

[1] Including 1 tobacco farm.

For the several classes of farms the average values per acre of products not fed to live stock are: Flowers and plants, $344.16; nursery products, $79.03; sugar, $19.97; vegetables, $17.51; fruit, $17.35; dairy produce, $4.46; miscellaneous, $4.17; hay and grain, $3.96; tobacco, $2.32; and live stock, $1.79. The wide variations in the averages and percentages of gross income are due largely to the fact that in computing gross income no deductions are made for expenses involved in operation. For florists' establishments, nurseries, and market gardens the average expenditure for such items as labor and fertilizers represents a far greater percentage of the gross income than in the case of hay and grain, live-stock, or miscellaneous farms. If it were possible to present the average net income, the variations shown would probably be comparatively slight.

FARMS CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

Tables 12 and 13 present data relating to farms classified by the reported value of products not fed to live stock.

TABLE 12.—NUMBER AND ACREAGE OF FARMS, AND VALUE OF FARM PROPERTY, JUNE 1, 1900, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK, WITH PERCENTAGES.

VALUE OF PRODUCTS NOT FED TO LIVE STOCK.	Number of farms.	NUMBER OF ACRES IN FARMS.			VALUE OF FARM PROPERTY.	
		Average.	Total.	Per cent.	Total.	Per cent.
The State	72,542	397.4	28,828,951	100.0	$796,527,955	100.0
$0	2,150	210.5	452,595	1.6	10,559,450	1.3
$1 to $49	2,516	114.9	289,203	1.0	6,039,600	0.8
$50 to $99	3,526	108.4	382,222	1.3	8,851,150	1.1
$100 to $249	10,385	119.7	1,242,669	4.3	32,246,390	4.1
$250 to $499	12,287	137.3	1,680,105	5.8	50,848,350	6.4
$500 to $999	13,979	185.8	2,597,321	9.0	83,649,170	10.5
$1,000 to $2,499	16,077	351.7	5,653,524	19.6	175,544,190	22.0
$2,500 and over	11,672	1,416.3	16,531,312	57.4	428,789,655	53.8

TABLE 13.—AVERAGE VALUES OF SPECIFIED CLASSES OF FARM PROPERTY, AND AVERAGE GROSS INCOME PER FARM, WITH PER CENT OF GROSS INCOME ON TOTAL INVESTMENT IN FARM PROPERTY, CLASSIFIED BY REPORTED VALUE OF PRODUCTS NOT FED TO LIVE STOCK.

VALUE OF PRODUCTS NOT FED TO LIVE STOCK.	AVERAGE VALUES PER FARM OF—					Per cent of gross income on total investment in farm property.
	Farm property, June 1, 1900.				Gross income (products of 1899 not fed to live stock).	
	Land and improvements (except buildings).	Buildings.	Implements and machinery.	Live stock.		
The State	$8,690	$1,068	$294	$928	$1,629	14.8
$0	3,987	413	75	367		
$1 to $49	1,830	386	64	144	42	1.7
$50 to $99	1,826	487	75	170	74	2.9
$100 to $249	2,243	541	94	226	167	5.4
$250 to $499	3,029	672	131	323	360	8.7
$500 to $999	4,490	813	187	496	711	11.9
$1,000 to $2,499	8,603	1,148	307	868	1,505	13.8
$2,500 and over	29,938	2,606	908	3,288	6,646	18.1

Many of the farms reporting no income for 1899 were fruit farms with trees or vines too young to bear; some were country homes of business or professional men; while others were homesteads taken up shortly prior to the date

of enumeration. There were some farms, also, from which no reports of the products of 1899 could be secured because the persons in charge, June 1, 1900, did not operate the farms in 1899. To this extent the reports fall short of giving a complete exhibit of farm income in 1899.

LIVE STOCK.

At the request of the various live-stock associations of the country, a new classification of domestic animals was adopted for the Twelfth Census.

The age grouping for neat cattle was determined by their present and prospective relations to the dairy industry and the supply of meat products. Horses and mules are classified by age, and neat cattle and sheep by age and sex. The new classification permits a very close comparison with the figures published in previous census reports.

Table 14 presents a summary of live-stock statistics.

TABLE 14.—NUMBER OF DOMESTIC ANIMALS, FOWLS, AND BEES ON FARMS, JUNE 1, 1900, WITH TOTAL AND AVERAGE VALUES, AND NUMBER OF DOMESTIC ANIMALS NOT ON FARMS.

LIVE STOCK.	Age in years.	ON FARMS.			NOT ON FARMS.
		Number.	Value.	Average value.	Number.
Calves	Under 1	329,430	$2,796,201	$8.49	4,478
Steers	1 and under 2	134,962	2,296,430	17.02	795
Steers	2 and under 3	109,158	2,722,526	24.94	991
Steers	3 and over	86,810	2,796,313	32.39	5,994
Bulls	1 and over	24,725	845,470	34.19	476
Heifers	1 and under 2	148,269	2,696,263	18.18	1,867
Cows kept for milk	2 and over	307,245	10,739,070	34.95	19,511
Cows and heifers not kept for milk.	2 and over	304,450	7,762,893	25.50	984
Colts	Under 1	28,049	423,427	18.37	724
Horses	1 and under 2	24,639	763,613	30.99	627
Horses	2 and over	378,605	16,657,953	44.59	92,820
Mule colts	Under 1	5,035	104,787	20.81	68
Mules	1 and under 2	6,469	247,975	38.33	84
Mules	2 and over	73,269	4,258,147	58.12	3,332
Asses and burros	All ages	2,227	146,697	65.87	500
Lambs	Under 1	838,855	1,579,388	1.88	4,515
Sheep (ewes)	1 and over	1,335,390	4,046,633	3.03	10,713
Sheep (rams and wethers).	1 and over	389,578	1,377,210	3.54	3,003
Swine	All ages	598,336	2,476,781	4.14	24,029
Goats	All ages	109,021	262,981	2.41	3,606
Fowls:[1]					
Chickens[2]		3,947,200	1,877,489		
Turkeys		158,856			
Geese		28,419			
Ducks		92,293			
Bees (swarms of)		129,444	363,885	2.81	
Value of all live stock.			67,242,112		

[1] The number reported is of fowls over 3 months old. The value is of all, old and young.
[2] Including Guinea fowls.

The total value of all live stock on farms and ranges, June 1, 1900, was $67,242,112. Of this amount the value of horses constituted 26.5 per cent; dairy cows, 16.0 per cent; other neat cattle, 32.6 per cent; sheep, 10.4 per cent; mules and asses, 7.1 per cent; swine, 3.7 per cent; poultry, 2.8 per cent; and all other live stock, 0.9 per cent.

No reports were received of the value of animals not on farms, but it is probable that such animals have higher average values than those on farms. Allowing the same averages, however, the total value of all live stock in the state, exclusive of poultry and bees not on farms, is approximately $72,827,000.

CHANGES IN LIVE STOCK KEPT ON FARMS.

The following table shows the changes since 1850 in the numbers of the most important domestic animals.

TABLE 15.—NUMBER OF SPECIFIED DOMESTIC ANIMALS ON FARMS AND RANGES: 1850 TO 1900.

YEAR.	Dairy cows.	Other neat cattle.	Horses.	Mules and asses.	Sheep.[1]	Swine.
1900	307,245	1,137,879	421,293	87,030	1,724,968	598,336
1890[2]	317,201	1,349,917	399,852	53,848	2,475,140	581,899
1880[2]	210,078	454,229	237,710	28,343	4,162,349	303,550
1870	164,993	407,305	192,273	17,533	2,768,187	444,617
1860	205,407	374,735	160,610	8,681	1,088,002	456,399
1850	4,280	258,879	21,719	1,666	17,674	2,776

[1] Lambs not included.
[2] Exclusive of animals on ranges.

The live-stock enumerations in 1880 and in 1890 did not include domestic animals on ranges, and hence the figures for those years presented in the table are not strictly comparable with the figures for 1900. The number of animals on ranges in 1890 was estimated by special agents to be as follows: All neat cattle, 241,300; horses, 22,542; mules and asses, 1,499; sheep, 897,896; swine, 9,110. In comparing the number of animals reported in 1900 with the number reported in 1890, these estimates are disregarded.

Since 1850 the number of dairy cows has increased more than seventyfold, but a decrease of 3.1 per cent is shown for the last decade. It is probable that this decrease is more apparent than real, as many of the 304,450 "cows and heifers not kept for milk" were doubtless milch cows dry at the time of enumeration. The fact that the production of milk has increased 38.2 per cent since 1890 supports this view.

The number of "other neat cattle" given for 1900 included 329,430 calves. It is uncertain whether or not calves were included in the reports for previous census years. If not, their number should be deducted from the total for 1900 when making comparisons with such reports. In that case a decrease since 1890 of 23.0 per cent would be shown in the number of "other neat cattle."

The numbers of horses and of mules and asses have steadily increased since 1850, the rates of gain for the last decade being 5.4 per cent for the former and 61.6 per cent for the latter. The number of sheep increased until 1880, since which date it has decreased, the loss for the last decade being 30.3 per cent. The number of swine has fluctuated from decade to decade, with a general upward tendency.

In comparing the poultry report for 1900 (see Table 14) with that of 1890, it should be borne in mind that in 1900 the enumerators were instructed not to report fowls less than 3 months old, while in 1890 no such limitation was made. This fact explains, to a great extent, the comparatively small increase in the number of chickens, and the following decreases in the number of other fowls: Geese, 24.5 per cent; turkeys, 45.0 per cent; and ducks, 60.5 per cent.

ANIMAL PRODUCTS.

Table 16 is a summarized exhibit of the products of the animal industry

TABLE 16.—QUANTITIES AND VALUES OF SPECIFIED ANIMAL PRODUCTS, AND VALUES OF POULTRY RAISED, ANIMALS SOLD, AND ANIMALS SLAUGHTERED ON FARMS IN 1899.

PRODUCTS.	Unit of measure.	Quantity.	Value.
Wool	Pounds	18,680,495	$1,737,088
Mohair and goat hair	Pounds	169,770	45,665
Milk	Gallons	[1]153,084,741	12,128,471
Butter	Pounds	20,853,360	
Cheese	Pounds	4,249,588	
Eggs	Dozens	24,443,540	3,864,679
Poultry			2,492,067
Honey	Pounds	3,667,738	331,939
Wax	Pounds	125,330	
Animals sold			13,305,165
Animals slaughtered			2,449,820
Total			36,324,894

[1] Includes all milk produced.

In 1899 the value of animal products was $36,324,894, or 30.7 per cent of the gross farm income. Of the above amount 43.4 per cent represents the value of animals sold and animals slaughtered on farms; 33.4 per cent, that of dairy produce; 17.5 per cent, that of poultry and eggs; 4.8 per cent, that of wool, mohair and goat hair; and 0.9 per cent, that of honey and wax.

DAIRY PRODUCE.

With respect to the number of farmers engaged in its pursuit, dairying holds fourth place among the various branches of California agriculture. Of the 72,542 farms of the state in 1900, 8,686, or 12.0 per cent, were dairy farms. The increase in the production of milk during the last decade was 42,493,555 gallons, or 38.2 per cent, although the population of the state increased but 22.7 per cent. The average production per capita for the state increased from 92.0 gallons in 1889 to 103.5 gallons in 1899. In Yolo, Calaveras, Trinity, and Stanislaus counties the gains were especially marked, the production in 1899 being between two and three times as great as that reported for 1889. Since 1880 the quantity of milk sold has increased 44,187,768 gallons, or over fourfold. These gains all support the conclusion that dairymen are not only keeping better cows, but devoting more care to their herds than they did ten years ago.

A comparison with the figures for 1890 shows a decrease of 22.1 per cent in the quantity of butter, and an increase of 9.8 per cent in the quantity of cheese, made on farms. In 1900 butter was reported by 32,088 farmers, who produced an average of 650 pounds per farm; cheese was reported by 420 farmers, but the average production per farm was 10,118 pounds.

Of the $12,128,471 given in Table 16 as the value of all dairy produce in 1899, $2,956,217, or 24.4 per cent, represents the value of dairy produce consumed on farms, and $9,172,254, or 75.6 per cent, the amount realized from sales. Of the latter amount, $5,847,591 was derived from the sale of 56,540,946 gallons of milk; $2,903,714, from 15,286,667 pounds of butter; $364,456, from 3,989,893 pounds of cheese; and $56,493, from 71,305 gallons of cream.

POULTRY AND EGGS.

The total value of the products of the poultry industry in 1899 was $6,356,746, of which amount 39.2 per cent represents the value of fowls raised and 60.8 per cent that of eggs produced. Nearly eleven million dozen more eggs were produced in 1899 than in 1889, the per cent of increase being 78.7.

WOOL.

The production of wool has decreased steadily since 1879. In the last decade the decrease was 2,678,052 pounds, or 16.4 per cent. The average weight per fleece, however, remained practically the same, having been 4.8 pounds in 1889 and 4.7 pounds in 1899. Lake, Tehama, and Shasta counties reported nearly one-half of the total number of fleeces of mohair and goat hair.

HONEY AND WAX.

The quantity of honey produced in 1899 was 3,667,738 pounds, a decrease of 262,151 pounds, or 6.7 per cent, from the production in 1889. The production of wax increased 91.5 per cent. The largest decreases in the production of honey were in the southernmost counties, where severe droughts injured the alfalfa and other food plants of the bee. There were marked increases in Fresno, Kern, and Tulare counties.

HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS.

Table 17 presents, for the leading groups of farms, the number of farms reporting horses and dairy cows, the total number of these animals, and the average number per farm. In computing the averages presented, only those farms which report the kind of stock under consideration are included.

TABLE 17.—HORSES AND DAIRY COWS ON SPECIFIED CLASSES OF FARMS, JUNE 1, 1900.

CLASSES.	HORSES.			DAIRY COWS.		
	Farms reporting.	Number.	Average per farm.	Farms reporting.	Number.	Average per farm.
Total	63,611	421,298	6.6	49,189	307,245	6.2
White farmers	62,258	414,406	6.7	48,960	306,473	6.3
Colored farmers	1,353	6,887	5.1	229	772	3.4
Owners[1]	46,203	271,755	5.9	36,124	172,618	4.8
Managers	2,372	45,934	19.4	1,616	20,448	12.7
Cash tenants	7,951	45,776	5.8	5,941	88,152	14.8
Share tenants	7,085	57,828	8.2	5,508	26,027	4.7
Under 20 acres	10,945	21,022	1.9	6,924	16,218	2.3
20 to 99 acres	18,790	61,438	3.3	14,024	44,566	3.2
100 to 174 acres	11,794	61,088	5.2	9,023	38,443	4.3
175 to 259 acres	4,339	29,218	6.7	3,704	22,343	6.0
260 acres and over	17,743	248,532	14.0	15,514	185,675	12.0
Hay and grain	17,083	164,348	9.6	13,728	56,518	4.1
Vegetable	2,529	10,756	4.3	1,342	4,557	3.4
Fruit	15,104	53,999	3.6	9,715	20,180	2.1
Live stock	14,147	114,977	8.1	10,806	54,387	5.0
Dairy	8,117	42,901	5.3	8,686	153,307	17.6
Sugar	350	2,917	8.3	261	731	2.8
Miscellaneous[2]	6,231	31,395	5.0	4,651	17,615	3.8

[1] Includes "part owners" and "owners and tenants."
[2] Including 1 tobacco farm.

CROPS.

The following table gives the statistics of the principal crops of 1899.

TABLE 18.—ACREAGES, QUANTITIES, AND VALUES OF THE PRINCIPAL FARM CROPS IN 1899.

CROPS.	Acres.	Unit of measure.	Quantity.	Value.
Corn	58,930	Bushels	1,477,093	$700,894
Wheat	2,683,405	Bushels	36,534,407	20,179,044
Oats	153,734	Bushels	4,972,356	1,700,397
Barley	1,029,647	Bushels	25,149,335	10,645,723
Rye	62,925	Bushels	524,451	251,486
Buckwheat	395	Bushels	7,895	3,945
Kafir corn	20,218	Bushels	420,452	193,244
Flaxseed	904	Bushels	12,610	10,559
Clover seed	----------	Bushels	14,409	67,550
Grass seed	----------	Bushels	1,113	1,847
Hay and forage	2,239,601	Tons	3,035,982	19,436,398
Tobacco	27	Pounds	23,490	4,352
Hemp	500	Pounds	620,000	45,000
Hops	6,891	Pounds	10,124,660	925,319
Broom corn	1,669	Pounds	1,146,000	40,506
Peanuts	433	Bushels	15,461	12,650
Castor beans	7	Bushels	125	250
Dry beans	45,861	Bushels	658,515	1,022,586
Dry pease	2,014	Bushels	57,299	70,033
Potatoes	42,098	Bushels	5,242,596	2,637,528
Sweet potatoes	1,607	Bushels	239,029	135,612
Onions	2,207	Bushels	514,859	296,671
Sugar beets	41,242	Tons	356,535	1,550,346
Miscellaneous vegetables	30,194	----------	----------	2,562,161
Chicory	78	Pounds	135,500	4,260
Sorghum cane	140	Tons	16	10
Sorghum sirup	----------	Gallons	8,671	3,778
Small fruits	6,353	----------	----------	911,411
Grapes	[2]133,362	Centals	7,214,334	[3]5,622,825
Orchard fruits	[2]340,978	Bushels	22,692,770	[4]14,526,786
Tropical fruits	[2]119,836	----------	----------	7,219,082
Nuts	----------	----------	----------	1,442,675
Forest products	----------	----------	----------	1,722,840
Flowers and plants	672	----------	----------	580,646
Seeds	1,673	----------	----------	121,896
Nursery products	2,914	----------	----------	558,329
Miscellaneous	----------	----------	----------	156,473
Total	7,025,515	----------	----------	95,365,712

[1] Sold as cane.
[2] Estimated from number of trees or vines.
[3] Including value of raisins, wine, etc.
[4] Including value of vinegar, cider, etc.

Of the total value of crops, cereals contributed 35.3 per cent; fruits, 29.7 per cent; hay and forage, 20.4 per cent; vegetables, including potatoes, sweet potatoes, onions, and sugar beets, 7.5 per cent; nuts, forest and nursery products, and flowers and plants, 4.5 per cent; and all other crops, 2.6 per cent.

The average values per acre of the principal crops were as follows: Flowers and plants, $864.06; nursery products, $191.60; small fruits, $143.46; hops, $134.28; hemp, $90.00; miscellaneous vegetables, $84.86; sweet potatoes, $84.39; Irish potatoes, $62.65; tropical fruits, $60.24; orchard fruits, $42.60; grapes, $42.16; sugar beets, $37.59; hay and forage, $8.68; and cereals, $8.41. The crops yielding the highest average returns per acre were grown upon very highly improved land. Their production requires a relatively large amount of labor, and, in addition, large expenditures for fertilizers.

CEREALS.

The following table is an exhibit of the changes in cereal production since 1849.

TABLE 19.—ACREAGE AND PRODUCTION OF CEREALS: 1849 TO 1899.

PART 1.—ACREAGE.

YEAR.[1]	Barley.	Buckwheat.	Corn.	Oats.	Rye.	Wheat.
1899	1,029,647	395	58,930	153,734	62,925	2,683,405
1889	815,995	664	70,303	57,569	27,413	2,810,807
1879	586,350	1,012	71,781	49,947	20,281	1,832,429

[1] No statistics of acreage were secured prior to 1879.

PART 2.—BUSHELS PRODUCED.

1899	25,149,335	7,895	1,477,093	4,972,356	524,451	36,534,407
1889	17,548,386	10,388	2,381,270	1,463,008	243,871	40,869,337
1879	12,463,561	22,307	1,993,825	1,341,271	181,681	29,017,707
1869	8,783,490	21,928	1,221,222	1,757,507	26,275	16,070,702
1859	4,415,426	76,887	510,708	1,043,006	62,140	5,928,470
1849	9,712	----------	12,236	----------	----------	17,328

In 1899 the total area devoted to cereals was 3,984,036 acres; in 1889 it was 3,812,751 acres; and in 1879, 2,561,800 acres. In the decade from 1889 to 1899, the acreage in oats increased 167.0 per cent; rye, 129.5 per cent; and barley, 26.2 per cent. Buckwheat shows a decrease of 40.5 per cent; corn, 23.3 per cent; and wheat, 5.5 per cent. Although the production of buckwheat, corn, and wheat decreased during the last decade, there was an increase of approximately 5 per cent in the total production of cereals. The largest acreages and quantities, and the largest average yields per acre are found along the San Joaquin and Sacramento rivers. San Joaquin county reports more barley, rye, and wheat than any other county; Sutter county, more buckwheat; and Sonoma county, more corn and oats. Nearly 85 per cent of the 420,452 bushels of Kafir corn reported, was grown in the south central counties of Fresno, Kings, Kern, and Tulare. The acreage given for cereals is exclusive of the acreage of grains cut green for hay and of the acreages of corn, nonsaccharine sorghum, and similar crops grown for forage and ensilage.

HAY AND FORAGE.

In 1900, 49,402 farmers, or 68.1 per cent of the total number, reported hay and forage crops. Excluding cornstalks and corn strippings, the average yield obtained was 1.4 tons per acre. The acreage in hay and forage in 1899 was 56.4 per cent greater than ten years before. In 1899 the acreages and yields of the various kinds of hay and forage crops were as follows: Wild, salt, or prairie grasses, 223,854 acres and 176,466 tons; millet and Hungarian grasses, 1,741 acres and 3,567 tons; alfalfa, or lucern, 298,898 acres and 838,730 tons; clover, 12,407 acres and 22,638 tons; other tame and cultivated grasses, 153,646 acres and 195,627 tons; grains cut green for hay, 1,506,360 acres and 1,714,692 tons; forage crops, 42,695 acres and 83,546 tons; cornstalks and corn strippings, 459 acres and 716 tons.

In Table 18 the production of cornstalks and corn strippings is included under "hay and forage," but the acreage

is included under "corn," as the forage secured was an incidental product of the corn crop.

HOPS.

The cultivation of hops in California is rapidly becoming an important industry, the quantities reported for each census year since 1860 being as follows: 1860, 80 pounds; 1870, 625,064 pounds; 1880, 1,444,077 pounds; and in 1890, 6,547,338 pounds. In 1900, 203 farmers reported an area of 6,891 acres, or an average of 33.9 acres per farm. They obtained and sold from this land in 1899, 10,124,660 pounds of hops, an average of 1,469 pounds per acre, and received therefrom $925,319, or an average of $4,558 per farm, $134 per acre, and $0.09 per pound.

The counties producing hops are mostly inland and extend from the extreme north over two-thirds the length of the state, Sonoma, Mendocino, and Sacramento counties reporting 62.0 per cent of the total acreage.

ORCHARD FRUITS.

The changes in orchard fruits since 1890 are shown in the following table.

TABLE 20.—ORCHARD TREES AND FRUITS: 1890 AND 1900.

FRUITS.	NUMBER OF TREES.		BUSHELS OF FRUIT.	
	1900.	1890.	1899.	1889.
Apples	2,878,169	1,269,784	3,488,208	1,654,636
Apricots	4,241,384	1,442,749	2,547,064	970,941
Cherries	686,891	236,945	321,034	154,063
Peaches	7,472,393	2,669,843	8,563,427	1,691,019
Pears	2,512,890	695,738	1,912,825	577,444
Plums and prunes	9,823,713	1,509,833	5,632,036	1,202,573

Of the farmers of the state, 27,491, or 37.9 per cent, reported orchard fruits in 1899. The value of orchard products was not reported by the census of 1890; but in 1879 it was $2,017,314, and in 1899, $14,526,786, a sixfold gain in twenty years. In making comparisons between the crops of different years, however, it should be remembered that the quantity of fruit produced in any year is determined largely by the nature of the season.

The number of orchard trees increased in the last decade from 7,824,892 to 28,138,471. The most noteworthy changes were in plum and peach trees, which increased about sixfold and threefold, respectively. In 1890, 34.1 per cent of all fruit trees in the state were peach trees, and 19.3 per cent plum and prune trees, while in 1900 the corresponding percentages were 26.6 and 34.9.

Plum and prune trees are found in the greatest numbers in the west central part of the state, more than one-third being in Santa Clara county. These trees increased so rapidly in the last decade that their number in 1900 was greater than the total number of orchard trees in 1890. Tuolumne is the only county in which the number of plum and prune trees has not increased since 1890.

The leading peach-growing counties are Fresno, Placer, Santa Clara, Tulare, Tehama, and Los Angeles; in 1900 they reported more than one-half of all the trees. Most counties reported a much greater number in 1900 than in 1890.

In the last ten years the number of apricot trees has more than doubled. Over one-third of these trees are in Santa Clara, Ventura, and Los Angeles counties.

Apple trees increased in number 126.7 per cent between 1890 and 1900. The coast counties report the largest numbers—Santa Cruz, Sonoma, Monterey, Los Angeles, Mendocino, and San Diego counties having more than one-half of the total number in the state.

The adjoining counties of Solano and Sacramento contain one-fifth of the pear trees in the state. Nearly three times as many were reported in 1900 as in 1890. Cherry trees, also, show a large increase, but are relatively of small importance.

In addition to the trees shown in Table 20, unclassified fruit trees to the number of 520,031 were reported, with a yield of 228,176 bushels of fruit. The value of orchard products for 1900, given in Table 18, includes the value of 2,395 barrels of cider, 6,339 barrels of vinegar, and 117,935,727 pounds of dried and evaporated fruits.

SEMITROPICAL FRUITS.

The following table shows the changes in semitropical fruits since 1890.

TABLE 21.—SEMITROPICAL TREES AND FRUITS: 1890 AND 1900.

FRUITS.	NUMBER OF TREES.		QUANTITIES OF FRUIT.		
	1900.	1890.	Unit of measure.	1899.	1889.
Citrons	4,780	1,757	Boxes	90	----------
Figs	188,941	109,585	Pounds	10,620,366	11,190,816
Guavas	7,056	11,495	Pounds	31,370	----------
Kaki	2,690	19,101	Pounds	59,400	----------
Lemons	1,493,113	82,611	Boxes	874,305	305,598
Limes	311	2,007	Boxes	125	----------
Oranges	5,648,714	1,153,881	Boxes	5,882,193	1,245,047
Pineapples	[1]1,815	[1]145,000	Number	440	----------
Pomeloes	80,918	144	Boxes	17,851	----------
Olives	1,530,164	278,380	Pounds	5,040,227	9,659,208
Miscellaneous	37,957	[2]5,250	Pounds	317,330	----------

[1] Number of plants.
[2] Banana trees.

The total number of semitropical fruit trees increased from 1,809,161 in 1890 to 8,996,459 in 1900. Of the number reported in 1900, 62.8 per cent were orange trees; 17.0 per cent, olive trees; 16.6 per cent, lemon trees; 2.1 per cent, fig trees; and 1.5 per cent, other trees.

The orange groves were reported chiefly by southern counties—San Bernardino, Los Angeles, Riverside, and Orange counties containing more than four-fifths of the trees. In 1900 the number reported was nearly five times as great as it was in 1890. All counties reporting oranges shared in the increase, except Lake and Santa Barbara. The production showed a still greater gain.

Olives are grown chiefly in the extreme southern counties—Los Angeles, San Diego, Ventura, Riverside, and San Bernardino furnishing the greater part of the crop of 1900. The number of olive trees reported in 1900 was nearly six times that reported in 1890. Excluding Los Angeles, the counties named showed a hundredfold increase.

San Diego and Los Angeles counties report over one-

half of the lemon trees of the state, and show marked increases since 1890, the number reported in 1900 being over eighteen times as great as ten years before.

The fig-growing industry centers in Fresno county. Pomeloes, or grape fruit, which in 1890 were reported in but 4 counties, are now grown in over one-half of the counties of the state. Pineapples are found chiefly in San Diego and Riverside counties, and citrons are confined almost exclusively to Los Angeles county. The remaining fruits are of small and decreasing importance.

SMALL FRUITS.

The total area used in the cultivation of small fruits in 1899 was 6,353 acres, distributed among 5,137 farms. The value of the fruits grown was $911,411, an average of $177.42 per farm. Of the total area, 2,418 acres, or 38.1 per cent, were devoted to strawberries; the total production for the state was 7,690,830 quarts, of which more than one-third was reported by Santa Cruz county. Next in importance are blackberries, of which 1,960 acres were reported. Sonoma county reported one-fourth of the total production of 4,159,131 quarts.

The acreage and production of other berries were as follows: Raspberries and Logan berries, 1,039 acres and 1,446,190 quarts; currants, 729 acres and 1,031,100 quarts; gooseberries, 135 acres and 195,670 quarts; and other small fruits, 72 acres and 59,030 quarts.

GRAPES.

Grapes were grown in 1899 by 13,064 farmers, who obtained 7,214,334 centals of fruit from 90,686,458 vines. The total value of the grapes, including the value of raisins and of 5,492,216 gallons of wine made on farms, was $5,622,825. Of the quantity of grapes reported, raisin grapes contributed 3,403,368 centals; wine grapes, 3,191,727 centals; and grapes for table use, 619,239 centals.

Of the 57 counties in California, all but 5 reported grape vines, and nearly one-fourth of the counties had over a million vines each.

Fresno, Sonoma, and Santa Clara are the leading counties in the cultivation of this fruit, reporting, in 1900, more than one-third of the vines of the state. Fresno county alone produced 2,125,388 centals of raisin grapes, 522,529 centals of wine grapes, and 94,418 centals of grapes for table use.

Of the counties reporting large acreages in vines, the greatest number of varieties of wine grapes were grown in Sonoma, Santa Clara, Napa, Sacramento, Los Angeles, and Alameda, while grapes for table use and raisins were reported principally by the adjoining counties of Fresno, Kings, Tulare, and Madera.

VEGETABLES.

The value of all vegetables produced in the state in 1899, including the value of potatoes, sweet potatoes, onions, and sugar beets, was $7,182,318. Of this amount 36.7 per cent represents the value of potatoes, a crop reported by 9,760 farmers, who obtained an average yield of 125 bushels per acre.

Aside from the land devoted to potatoes, sweet potatoes, onions, and sugar beets, 30,194 acres were used in the growing of miscellaneous vegetables. Of this area the products of 9,908 acres were not reported in detail. Of the remaining 20,286 acres, concerning which detailed reports were received, 4,292 acres were devoted to tomatoes; 2,368, to asparagus; 2,123, to sweet corn; 2,024, to watermelons; 1,949, to cabbages; 1,654, to celery; 1,231, to green peas; 1,209, to pumpkins; and 3,436, to other vegetables.

SUGAR BEETS.

Sugar beets were reported in California in 1880, but it was not until within the last decade that their production became an important branch of agriculture in the state. In 1899, 863 farmers devoted to this crop an area of 41,242 acres, an average of 47.8 acres per farm. They obtained and sold from this land 356,535 tons of beets, an average yield of 8.6 tons per acre, and received therefrom $1,550,346, an average of $1,796 per farm, $38 per acre, and $4.35 per ton.

These beets were grown in 17 counties in the central and southern coast regions; the counties of Ventura, Monterey, Santa Clara, and Alameda, ranking in the order named, reported 70.6 per cent of the total acreage.

FLORICULTURE.

Flowers and plants were grown for market in 1899 by 280 farmers, of whom 208 derived their principal income from the sale of floral products. These commercial florists had invested a capital of $1,280,281, of which $766,310 represents the value of land; $467,025, that of buildings and other improvements; $36,881, that of implements; and $9,465, that of live stock. They expended $110,705 for labor and $7,379 for fertilizers. The value of the flowers and plants grown by the commercial florists was $511,125, and that of those grown by others, $69,521.

LAND UNDER GLASS.

Owing to the natural advantages of the climate of California, the amount of glass used is not so large, in proportion to the value of the products raised, as in most other states. In 1900, 429 farms reported land under glass, with an aggregate area of 1,572,480 square feet. Of the 208 florists in the state only 150 use glass, and they have 1,636,721 square feet of glass surface, equivalent to 1,227,541 square feet of land under glass.

NURSERIES.

Trees and shrubs valued at $558,329 were grown in 1899, by 245 farmers, of whom 141 derived their principal income from the sale of nursery stock. The farms of these commercial nurserymen were worth $1,725,945, of which $1,515,630 represents the value of land; $10,315, that of buildings; and $55,243, that of implements, machinery, and live stock. The expenditure for labor was $158,845, and for fertilizers, $8,607.

LABOR AND FERTILIZERS.

The total expenditure for labor on farms in 1899, including the value of board furnished, was $25,845,120, an

average of $356 per farm. The average was highest on the most intensively cultivated farms, being $1,123 for nurseries, $1,053 for sugar farms, $532 for florists' establishments, $434 for hay and grain farms, $428 for fruit farms, $353 for vegetable farms, $259 for dairy farms, and $255 for live-stock farms. "Managers" expended, on an average, $1,732; "share tenants," $418; "cash tenants," $361; and "owners," $214. White farmers expended $354 per farm, and colored farmers, $463.

Fertilizers purchased in 1899 cost $937,050, or an average of $13 per farm; in 1889 the total value of fertilizers purchased was only $148,886. The average expenditure in 1899 was greatest for nurseries, amounting to $61; for fruit farms it was $38; for florists' establishments, $35; for sugar farms, $8; for hay and grain farms, $7; for vegetable farms, $6; for dairy farms, $3; and for live-stock farms, $2.

INDIAN RESERVATIONS.

At the present time most of the Indians in California are located on 26 reservations, namely: Hupa Valley, Round Valley, Tule River, Yuma, and 22 Mission reservations. They comprise a large number of tribes and represent at least fourteen different linguistic stocks. At least one-half of them can use enough English to carry on ordinary conversation, and the greater number wear citizens' clothing. They are, as a rule, self-supporting, rations being issued only to the old and infirm.

HUPA VALLEY RESERVATION.

The Hupa Valley reservation, in Humboldt county, comprises an area of 155 square miles. The reservation proper consists principally of timber or grazing land with a cultivable area of about 1,200 acres.

The total number of Indians on the reservation June 1, 1900, was 1,112. Of this number many were in possession of well stocked farms, the average tillable area being 30 acres. Several of the Indian farmers own improved implements and machinery, and raise profitable crops of corn, oats, wheat, and hay. They have orchards of peach, pear, apple, and cherry trees.

Very little attention is given to dairying, but the sales of domestic animals and animal products in 1899 amounted to $4,800.

ROUND VALLEY RESERVATION.

Round Valley reservation, in Mendocino county, embraces an area of 59 square miles. The fertile soil of the valley and the fine grazing land of the surrounding foothills, offer excellent opportunities for agricultural operations. The reservation had a population, June 1, 1900, of 599, and the average allotment of agricultural land at that time was 40 acres per family.

The farms, as a rule, are well stocked and provided with modern machinery. The principal crops are wheat, oats, and barley, in the order named, although a large acreage of wild hay is cut each year. Small orchards, comprising a large variety of fruit trees, are reported, and also considerable quantities of vegetables. In 1899 nearly all farmers owned cattle, many having large herds. At the time of the enumeration one farmer had 150 cows not kept for milk, valued at $3,000, and his sales of live stock and other animal products in 1899 amounted to $1,700. Swine and poultry are kept on most farms.

TULE RIVER RESERVATION.

This reservation is located in Tulare county and comprises 76 square miles, the greater portion of which is timber and grazing land. Less than 250 acres, made up of scattered patches of 5 or 10 acres each, is suitable for cultivation.

Most of the 143 Indians on the reservation derive their living from stock raising, or through employment as sheep shearers at certain seasons of the year.

In 1899, 36 acres were devoted to corn, wheat, and barley, and 44 acres to alfalfa and grains cut green for hay. A small acreage was used in the cultivation of melons, squashes, sweet corn, and dry beans. Nearly all crops are irrigated.

Some farms are well stocked with range cattle and small herds of Indian ponies, and in 1899, 18 farmers reported sales of live stock and animal products.

YUMA RESERVATION.

The Yuma reservation of 71¼ square miles is located in San Diego county, and had a population, June 1, 1900, of 817. In manners and customs these Indians are the most primitive of the California tribes. Their food consists principally of fish and the mesquite bean, which grows in abundance on the reservation.

They cultivate only a small acreage of land, and even in favorable seasons seldom raise more than one hundred bushels each of corn, wheat, and barley. In the census year their crop was a total failure. The Yumas own no cattle, their live stock being limited to a few horses, mules, and burros, and several hundred chickens.

THE MISSION RESERVATIONS.

Most of the Mission Indians are located on small reservations scattered over Riverside and San Diego counties. Few of these reservations have any appreciable amount of arable land, and some are practically desert. The extreme drought of the two years immediately preceding the census year worked great hardship among them, and their crops in 1899 were nearly complete failures. Morongo reservation, the largest and most prosperous of all, is provided with cement irrigation ditches constructed by the Government, and was the only reservation which reported any crops in 1899. Small quantities of corn, wheat, and alfalfa were secured. Orchard products were reported by most farmers on this reservation.

IRRIGATION STATISTICS.

California, with its varied topography, soil, and climate, offers an interesting field for the study of irrigation. No other state produces such a variety of crops, and in no other state have agricultural lands, as such, reached the selling price of the semitropical fruit orchards of southern California. Except in a few localities there is not, in California, the absolute necessity for irrigation that exists in most other western states and territories. On nearly all of the lands that are irrigated some crops will grow, in ordinary seasons, without artificial application of water. The more valuable crops, however, usually require irrigation, and with it the yield of all crops is increased greatly. An irrigation system is an insurance against crop failure in years of drought.

Table A is a comparative exhibit, by counties, of the number of irrigators and the acreages irrigated in 1889 and in 1899.

TABLE A.—NUMBER OF IRRIGATORS, AND ACRES IRRIGATED, WITH PERCENTAGES OF INCREASE, BY COUNTIES: 1889 AND 1899.

COUNTIES.	NUMBER OF IRRIGATORS.			ACRES IRRIGATED.		
	1899.	1889.	Per cent of increase.	1899.	1889.	Per cent of increase.
The State	25,675	13,732	87.0	1,446,114	1,004,233	44.0
Alameda	101			2,532		
Alpine	33	31	6.5	4,391	2,680	63.8
Amador	137	221	[1] 38.0	1,167	3,136	[1] 62.8
Butte	455	372	22.3	7,332	5,478	33.8
Calaveras	143	57	150.9	1,476	582	153.6
Colusa[2]	62	93	38.7	2,995	7,525	[1] 41.8
Glenn[2]	67			1,382		
Eldorado	295	425	[1] 30.6	3,387	4,318	[1] 21.6
Fresno[3]	2,459	1,400	84.2	283,737	105,605	190.6
Madera[3]	120			23,152		
Inyo	362	209	73.2	41,026	46,212	[1] 11.3
Kern	653	370	76.5	112,533	154,549	[1] 27.2
Kings[4]	780		74.6	92,794	168,455	6.6
Tulare[4]	1,467	1,287		86,864		
Lake	45	68	[1] 33.8	523	958	[1] 45.4
Lassen	318	293	6.8	49,684	55,819	[1] 11.1
Los Angeles	4,066	1,843	120.6	85,644	70,164	22.1
Mariposa	66	90	[1] 26.7	574	730	[1] 21.4
Merced	520	231	125.1	111,330	32,309	244.6
Modoc	467	402	16.2	78,016	80,110	[1] 2.6
Mono	97	94	3.2	59,202	43,523	36.0
Monterey	88	21	319.0	6,675	891	649.2
Nevada	283	318	[1] 11.0	4,003	3,990	0.3
Orange	1,558	1,039	50.0	41,549	31,816	30.6
Placer	518	431	20.2	10,308	7,480	37.8
Plumas	187	186	0.5	28,423	34,196	[1] 16.9
Riverside[5]	1,737		126.5	32,947	57,907	80.0
San Bernardino[5]	1,854	1,521		37,877		
San Diego[5]	1,041	524		16,022	10,193	
Sacramento	425	146	191.1	12,409	1,718	622.3
San Benito	166	77	115.6	2,870	905	217.1
San Joaquin	414	84	392.9	18,466	2,254	719.3
San Luis Obispo	78			1,137		
Santa Barbara	182	47	287.2	3,218	396	712.6
Santa Clara	1,129	184	513.5	40,097	6,686	499.7
Shasta	686	475	44.4	16,159	13,662	18.3
Sierra	98	86	14.0	13,603	14,499	[1] 6.2
Siskiyou	594	302	96.7	49,108	31,567	55.6
Solano	29			2,805		
Stanislaus	221	42	426.2	17,505	3,370	419.4
Tehama	209	116	80.2	11,512	7,169	60.6
Trinity	170	140	21.4	4,710	3,186	47.8
Tuolumne	185	100	85.0	1,381	1,285	7.5
Ventura	353	134	163.4	11,935	3,347	256.6
Yolo	167	39	328.2	5,161	1,602	222.2
Yuba	181	122	48.4	2,477	2,852	[1] 13.1
All other counties	350	112	212.5	3,884	1,019	276.3
Indian reservations	64			242		

[1] Decrease.
[2] Glenn organized from part of Colusa in 1892.
[3] Madera organized from part of Fresno in 1893.
[4] Kings organized from part of Tulare in 1893.
[5] Riverside organized from parts of San Bernardino and San Diego in 1893.

The sketch map represents, by areas, in solid black, the principal regions in which irrigation has been successfully applied to any considerable extent.

In the ten years ending with 1899 the number of irrigators in the state increased from 13,732 to 25,675, or 87.0 per cent; and the area irrigated, from 1,004,233 acres to 1,446,114 acres, or 44.0 per cent. Of the total improved acreage in 1900, 12.1 per cent was reported as irrigated, but the area actually irrigated was much greater than reported. In many localities, large areas which are of little value without water, and upon which water has not been directly applied, have been made fertile by the seepage from neighboring irrigated land. In most cases the enumerators did not report such land as irrigated, but correspondence established the fact that extensive areas were benefited in this way.

The census year 1899 was the third consecutive year of extremely light rainfall. New ditches were built to supply lands that do not usually require irrigation, while other ditches were wholly or partially abandoned because of failure of the water supply.

As the artificial application of water requires more than the ordinary amount of labor and capital, there is, in most irrigation districts, a marked tendency toward intensive farming. In 1889 the average size of the irrigated farms of California was 73 acres, while in 1899 it was but 57 acres.

Table B is an exhibit, by counties, of the number of irrigated farms compared with the total number of farms, and of the irrigated acreage compared with the total improved acreage.

TABLE B.—NUMBER OF IRRIGATED FARMS COMPARED WITH TOTAL NUMBER OF FARMS, AND IRRIGATED ACREAGE COMPARED WITH TOTAL IMPROVED ACREAGE, JUNE 1, 1900.

COUNTIES.	NUMBER OF FARMS.			IMPROVED ACREAGE.		
	Total.	Irrigated.	Per cent irrigated.	Total.	Irrigated.	Per cent irrigated.
The State	72,542	25,675	35.4	11,958,837	1,446,114	12.1
Alameda	2,787	101	3.6	220,118	2,532	1.1
Alpine	37	33	89.2	4,391	4,391	100.0
Amador	560	137	24.5	48,936	1,167	2.4
Butte	1,179	455	38.6	302,029	7,332	2.4
Calaveras	575	143	24.9	41,402	1,476	3.6
Colusa	582	62	10.7	358,227	2,995	0.8
Eldorado	759	295	38.9	45,181	3,387	7.4
Fresno	3,290	2,459	74.7	786,337	283,737	36.1
Glenn	529	67	12.7	355,781	1,382	0.4
Inyo	424	362	85.4	48,740	41,026	93.8
Kern	1,098	653	59.5	324,031	112,533	34.7
Kings	932	780	83.7	262,148	92,794	35.4
Lake	723	45	6.2	41,414	523	1.3
Lassen	555	313	56.4	133,206	49,684	37.2
Los Angeles	6,577	4,066	61.8	518,744	85,644	16.5
Madera	523	120	22.9	277,721	23,152	8.3
Mariposa	381	66	17.3	14,003	574	4.1
Merced	999	520	52.1	613,876	111,330	18.2
Modoc	638	467	73.2	122,647	78,016	63.6
Mono	112	97	86.6	65,288	59,202	90.7
Monterey	1,850	88	4.7	373,005	6,675	1.8
Nevada	522	283	54.2	24,898	4,003	16.1
Orange	2,388	1,558	65.2	238,847	41,549	17.5
Placer	1,073	518	48.1	121,003	10,308	8.5
Plumas	267	187	70.0	57,851	28,423	49.6
Riverside	2,340	1,737	74.2	216,083	32,947	15.3
Sacramento	1,392	425	30.5	327,159	12,409	3.8
San Benito	907	166	18.3	168,698	2,870	1.7
San Bernardino	2,350	1,854	78.9	96,920	37,877	39.1
San Diego	2,698	1,041	38.6	229,791	16,022	7.0

TABLE B.—NUMBER OF IRRIGATED FARMS COMPARED WITH TOTAL NUMBER OF FARMS, AND IRRIGATED ACREAGE COMPARED WITH TOTAL IMPROVED ACREAGE, JUNE 1, 1900—Continued.

COUNTIES.	NUMBER OF FARMS.			IMPROVED ACREAGE.		
	Total.	Irrigated.	Per cent irrigated.	Total.	Irrigated.	Per cent irrigated.
San Joaquin	1,966	414	21.1	652,928	18,466	2.8
San Luis Obispo	1,813	78	4.3	412,356	1,137	0.3
Santa Barbara	1,149	182	15.8	202,982	3,218	1.6
Santa Clara	3,995	1,129	28.3	290,285	40,097	13.8
Shasta	1,221	686	56.2	86,540	16,159	18.7
Sierra	141	98	69.5	26,687	13,603	51.0
Siskiyou	931	594	63.8	181,029	49,108	27.1
Solano	1,151	29	2.5	344,058	2,805	0.8
Stanislaus	951	221	23.2	622,700	17,505	2.8
Tehama	1,055	209	19.8	269,693	11,712	4.3
Trinity	272	170	62.5	14,144	4,710	33.3
Tulare	2,212	1,467	66.3	546,289	86,854	15.9
Tuolumne	457	185	40.5	36,461	1,381	3.8
Ventura	1,269	353	27.8	174,419	11,935	6.8
Yolo	1,214	167	13.7	351,213	5,161	1.5
Yuba	483	181	37.5	154,013	2,477	1.6
All other counties	12,925	350	2.7	1,150,406	3,834	0.3
Indian reservations	287	64	22.3	5,244	242	4.6

In 1889, 26.0 per cent of the farms of California were irrigated, and in 1899, 35.4 per cent. Of the improved acreage, 8.2 per cent was irrigated in 1889, and 12.1 per cent in 1899.

It is difficult to fix upon any basis for a comparison of land values which will show the actual value added to the land through irrigation alone. Most of the lands have some agricultural value without irrigation. After water is supplied the value depends chiefly upon the use to which the land is put, and, in the case of orchards, upon the age and condition of the trees. While irrigation is not the only agency giving value to the higher-priced farming lands, it is a vital factor in most cases. In every section of the state are tracts of naturally moist land, as productive as the neighboring irrigated lands, and of the same average value. The area of such tracts, however, is small.

Table C gives the acreage and production of all crops, and of the crops grown on irrigated land in 1899.

TABLE C.—ACREAGE AND PRODUCTION OF PRINCIPAL IRRIGATED CROPS IN 1899.

CROPS.	ACREAGE.			PRODUCTION.			
	Total.	Irrigated.	Per cent irrigated.	Unit of measure.	Total.	Irrigated.	Per cent irrigated.
Alfalfa	298,898	228,970	76.6	Tons	838,780	664,274	79.2
Grains cut green for hay	1,506,360	89,158	5.9	Tons	1,714,692	117,257	6.8
Other hay and forage crops	434,802	169,294	38.9	Tons	482,560	216,207	44.8
Grapes	133,362	37,210	27.9	Pounds	721,433,373	329,934,723	45.7
Orchard fruits	[1]340,978	[1]138,778	40.7	Bushels	28,756,589	11,048,703	46.5
Subtropical fruits	[1]119,836	[1]85,922	71.7				
Small fruits	6,353	3,161	49.8				
Barley	1,029,647	83,725	8.1	Bushels	25,149,335	1,582,612	6.1
Corn	53,930	15,215	28.2	Bushels	1,477,093	490,802	33.2
Oats	153,734	5,318	3.5	Bushels	4,972,856	172,125	3.5
Rye	[illegible]925	956	1.5	Bushels	524,451	10,890	2.1
Wheat	2,683,[illegible]05	161,086	6.0	Bushels	36,534,407	1,649,455	4.5
Potatoes	42,098	20,435	48.5	Bushels	5,242,596	3,119,690	59.5
Sweet potatoes	1,607	1,241	77.2	Bushels	239,029	198,877	83.2
Onions	2,207	1,369	62.0	Bushels	514,859	371,542	72.2

[1] Estimated from number of trees or vines.

California has two great mountain systems, the Sierra Nevada, extending along the eastern border, and the Coast Range, following the coast line. These systems are joined in the northern part of the state in the vicinity of Mt. Shasta, and in the southern part near Mt. Tehachapi. Between the two ranges lie the valleys of the Sacramento and San Joaquin rivers, containing most of the agricultural lands of the state. North of the Sacramento Valley is a rugged region drained by the Klamath River. In the extreme eastern portion of the state are a few rivers which flow east into lakes situated near the California-Nevada boundary line, while along the entire coast are streams flowing from the Coast Range into the ocean. In the southern portion of the state, also, there are several small rivers of great agricultural importance.

For convenience the following divisions—arbitrary in a measure, but conforming as far as practicable to the natural drainage basin divisions—have been adopted: Counties bordering on San Francisco Bay—Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma; counties of the north coast—Del Norte, Humboldt, and Mendocino; counties drained by Klamath River—Siskiyou and Trinity; counties drained by Sacramento River—Amador, Butte, Colusa, Eldorado, Glenn, Lake, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Sutter, Tehama, Yolo, and Yuba; counties drained by San Joaquin River—Calaveras, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, Tulare, and Tuolumne; drained by Carson River—Alpine county; drained by Owens Lake—Inyo county; drained by Mono Lake and Walker River—Mono county; drained by San Benito River—San Benito county; coast counties from San Francisco Bay south, to and including Los Angeles county—Los Angeles, Monterey, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura; counties drained by Santa Ana River—Orange, Riverside, San Bernardino, and San Diego. A portion of the area of the counties included in the Sacramento River division is really in other and smaller drainage basins, the most important of which is the Honey Lake basin.

In certain localities the necessity and value of water for particular crops, and especially for fruit, has led to extraordinary and successful efforts to obtain it from under-

ground sources. This is particularly true of Los Angeles, Orange, Riverside, Santa Clara, San Bernardino, and Tulare counties, although in nearly every county some irrigation from wells is reported.

Table D shows, by the above divisions, the number of farms, and the acreage, watered from two sources, namely: From open streams, lakes, and springs, and from wells and tunnels. In some instances land supplied with water from streams during the winter months is irrigated from wells in the summer. Land thus watered has been regarded as irrigated from streams, and the acreage is not included in the figures showing well irrigation.

TABLE D.—NUMBER OF FARMS AND ACRES IRRIGATED FROM STREAMS AND FROM WELLS IN 1899.

DIVISIONS.	NUMBER OF FARMS IRRIGATED.			NUMBER OF ACRES IRRIGATED.		
	Total.	From streams.	From wells.	Total.	From streams.	From wells.
The State	25,675	18,781	6,894	1,446,114	1,293,608	152,506
Counties bordering on San Francisco Bay	1,437	335	1,102	47,619	20,152	27,467
North coast counties	91	70	21	356	286	70
Counties drained by Klamath River[1]	765	756	9	53,823	53,768	55
Counties drained by Sacramento River[2]	4,611	4,153	458	248,874	241,128	7,746
Counties drained by San Joaquin River[3]	7,049	6,554	495	749,917	732,326	17,591
Alpine county, drained by Carson River	33	33	----	4,391	4,391	----
Inyo county, drained by Owens Lake	362	362	----	41,026	41,021	[4]5
Mono county, drained by Mono Lake and Walker River	97	97	----	59,202	59,202	----
San Benito county, drained by San Benito River	166	84	82	2,870	1,868	1,002
Coast counties from San Francisco Bay south to and including Los Angeles county	4,832	2,044	2,788	109,424	54,863	54,561
Counties drained by Santa Ana River[5]	5,191	3,708	1,483	112,590	72,798	39,792
San Diego county	1,041	585	456	16,022	11,805	4,217

[1] Includes Hupa Valley Indian reservation.
[2] Includes irrigated area of Honey Lake basin.
[3] Includes Tule River Indian reservation.
[4] Same acreage irrigated also from streams.
[5] Includes Mission Indian reservation.

Water is obtained from open streams, lakes, and springs by two methods, gravity and pumping. By the gravity system, water is directed into the ditches usually by temporary or permanent dams thrown across the streams, but in some cases the bottom of the ditch is made lower at its head than the bed of the stream, thus obviating the necessity of dam building. Sometimes the stream is dammed and the water allowed to flood the contiguous lands, no ditches being used. This method is employed chiefly along the Pitt River. In the lower portions of the Sacramento and San Joaquin valleys, several thousand acres of land are moistened by water let in through headgates built in the levees which protect the reclaimed marsh lands from the river. The construction and maintenance of these intake gates and the distributing ditches involve much labor and expense, and the acreage so watered has, therefore, been included with the irrigated area.

Table E presents, by divisions, the principal statistics relating to the canals and ditches receiving water from streams by gravity, and used solely or chiefly for irrigation purposes in 1899.

TABLE E.—NUMBER, LENGTH, AND COST OF CONSTRUCTION OF MAIN CANALS AND DITCHES RECEIVING WATER FROM STREAMS BY GRAVITY, AND USED SOLELY OR CHIEFLY FOR IRRIGATION PURPOSES.

DIVISIONS.[1]	Acreage irrigated in 1899.	MAIN CANALS AND DITCHES.			
		Number.	Length in miles.	Cost of construction.	
				Total.	Per acre irrigated in 1899.
The State[1]	1,248,178	1,913	5,106	$12,855,012	$10.30
Counties bordering on San Francisco Bay	15,978	128	87	112,100	7.02
North coast counties	186	51	18	2,475	13.31
Counties drained by Klamath River	53,768	446	651	257,124	4.78
Counties drained by Sacramento River[2]	185,358	818	1,819	1,594,900	8.60
Counties drained by San Joaquin River	724,329	201	1,422	6,293,636	8.69
Counties drained by Carson and Walker rivers, Mono Lake, and Owens Lake	104,614	145	531	610,398	5.83
San Benito county drained by San Benito River	1,868	6	17	36,000	19.27
Coast counties from San Francisco Bay south to and including Los Angeles county	48,626	57	210	1,076,492	22.14
Counties drained by Santa Ana River	111,366	43	324	2,782,910	24.99
San Diego county	2,090	15	27	88,977	42.57

[1] Indian reservations not included.
[2] Includes irrigated area of Honey Lake basin.

In 1899 there were operated in California 1,913 ditches receiving water from open streams, lakes, and springs by gravity, and used chiefly or solely for irrigation purposes. The total cost of constructing these ditches was $12,855,012, and the area irrigated in the census year was 1,248,178 acres, making the average cost of construction per acre irrigated in 1899, $10.30. The total length of the main ditches was 5,106 miles.

Many ditches, especially in the southern part of the state, are supplied with water from other canals, although operated as separate systems. The business relations between the operators of the major system and the subsystems are often complicated, and the limitations of an investigation conducted chiefly by correspondence have made it necessary to consider as laterals all ditches not receiving water directly from streams. Consequently, the mileage and the cost of construction of many ditches which are operated, in a measure, under independent management, are not included in Table E.

Santa Clara is the only county of the first division in which irrigation is practiced to any considerable extent. The water taken from streams, which is supplied principally by Penitencia Creek, is used chiefly for orchards, and is applied during the winter season, two or three applications generally being sufficient. In the other counties of this division irrigation is used chiefly for truck farms, although in Alameda county several hundred acres of alfalfa were irrigated from Alameda Creek and other small streams.

The coast counties north of San Francisco Bay have a heavy winter rainfall, and a summer precipitation from dews and fogs. There is some irrigation for truck gardens, and on the higher lands of Mendocino county a number of

farmers apply water to their alfalfa fields. There are no large canals, each irrigator usually operating a small ditch of his own.

In 1899, 53,763 acres in Siskiyou and Trinity counties were irrigated from streams, principally the tributaries of the Klamath River. Irrigation is practiced chiefly for hay and forage crops. The ditches used are generally of simple construction and comparatively inexpensive.

From the Sacramento River and its many tributaries, and from the streams flowing into Honey Lake, 241,128 acres were irrigated in 1899. Gravity ditches used solely or chiefly for irrigation supplied 185,358 acres, while a large area was watered from canals used principally for mining purposes. In the northern counties of this division, the method of damming streams, causing them to flood the contiguous land, is often employed. Irrigation is sometimes used on the reclaimed marsh lands bordering the Sacramento River near its mouth.

The southern portion of the great interior basin of California is composed of the San Joaquin, Tulare, and Kern valleys. There are no distinct lines of demarcation between these valleys, and they are usually included in the general term "San Joaquin Valley," the San Joaquin River being the only drainage outlet to the sea. In this division 749,917 acres were irrigated in 1899, of which area 732,326 acres were supplied with water from streams, and a comparatively small acreage from ditches used principally for mining or power purposes. The owners of a number of farms which were formerly marsh lands, but are now protected from the river by levees, have successfully practiced irrigation by filling ditches with river water siphoned over the levees or let in through flood gates. In 1899 the number of ditches operated by gravity was 201, from which 724,329 acres were watered.

In Alpine, Mono, and Inyo counties, agriculture without irrigation is practically impossible, and in these counties in 1899, 104,614 acres were irrigated. The water was supplied by streams, and was conducted by ditches built for irrigation purposes.

There were six irrigation ditches in San Benito county in 1899, from which 1,868 acres were supplied with water. Alfalfa was the principal crop irrigated.

In the coast counties from San Francisco Bay south to and including Los Angeles county, the number of irrigation ditches obtaining water from streams by gravity in 1899 was 57. From these ditches 48,626 acres, principally in Los Angeles and Ventura counties, were irrigated. Water is used chiefly for orchards and for hay and forage crops.

In the three counties drained by the Santa Ana River there were, in 1899, 111,366 acres irrigated from streams by gravity ditches. In these counties, and in Los Angeles county, the water supply of several gravity systems is supplemented by water pumped from streams and wells, and in some instances by water from artesian wells. In such cases the cost of the pumping plants and sinking wells has been deducted from the construction cost of the systems, as shown in Table E. In the greater portion of California, most of the water in the rivers runs waste, but in the counties south of the San Joaquin Valley the flow of the streams is completely utilized.

In San Diego county the principal systems from which water is obtained, although constructed as gravity ditches, are not included in the figures of Table E, as, on account of the light rainfall in 1899, the San Diego Land and Water Company and the San Diego Flume Company were compelled to pump water from wells. The majority of ditches reported had water for a short period only, and the acreage irrigated from each was much less than in an average year.

In 1899, 11,780 acres in the state were irrigated with water pumped from open streams and lakes. The plants used were similar to those employed in pumping from wells. On the lower Sacramento River a barge fitted with two 15-inch rotary pumps driven by an engine of 150 horsepower, was successfully operated in irrigating the lands of its owners. The barge had a propelling wheel, and was rigged with pipes, derricks, etc., for lifting the water above the banks. This was the only floating plant reported.

Wells have an important place in the agricultural economy of California. Exclusive of the area watered from ditches whose stream supply was supplemented by water derived from underground sources, there were, in 1899, 152,566 acres irrigated from wells and tunnels. Water from streams is considered better for the soil than that from wells, as it fertilizes as well as moistens the land, while well water is sterile and often contains alkalies to a harmful degree. But, notwithstanding these admitted disadvantages, some prefer well irrigation, as the supply is certain and can be applied at the times and in the quantities desired.

Water is obtained from underground sources in three ways: By pumping from wells, by driving tunnels in the sides of hills and mountains, and by using flowing wells. Windmills are not generally employed, even the smaller plants being operated by steam, gasoline, or electricity. Many of the systems are large and expensive, and plants costing $10,000 or more, used for single farms, are not uncommon. Repairing is an important matter in the operation of pumping plants, not only on account of the expense, but because a breakdown might occur when the water is most needed. For this reason, and because they are more efficient, centrifugal and pneumatic pumps are preferred to plunger pumps. The principal elements governing the cost of operating a pumping plant are the kind and condition of the machinery, fuel, labor, the height to which the water must be lifted and the distance it must be carried, and repairing. As a rule, the larger the plant the less the cost of water per inch, and for this reason the farmers in many localities have built cooperative plants.

The fuel generally used is oil, either crude or distillate. With the development of California's oil fields this fuel became cheaper, making it profitable to pump water for crops. The oil industry and irrigation are mutually helpful. In 1899 the highest price reported for crude oil was

paid in Tulare county—7 cents per gallon for a drum of 110 gallons. The lowest price was reported from Santa Clara county—85 cents for a barrel of 42 gallons, or a little more than 2 cents per gallon. The price of distillate varied from 9 cents in Los Angeles county to 13 cents in Yolo county; and that of gasoline, from 15 cents in Santa Clara county to 20 cents in Colusa county. Most of the pumping plants in Santa Clara county use wood for fuel. Wood costs from $2.50 to $8.00 per cord. One irrigator reported that he had substituted an oil engine, using $2.10 worth of crude oil per day for a wood-burning plant which, while consuming $8.00 worth of fuel per day, pumped only the same quantity of water. Coal is used to some extent, and a few plants burn the branches trimmed from orchards. Most of the plants in Tulare county are operated by electricity furnished by power companies.